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MECHANICALLY PROCESSING Wholesale Frozen Food ORDERS

AMS-317

U.S. DEPARTMENT OF AGRICULTURE

Marketing Research Division Agricultural Marketing Service Washington, D.C.

ACKNOWLEDGMENTS

The following companies made their facilities available for detailed studies under the project covered in this report.

Albany Frosted Foods
Burris Frosted Foods
Gaudio Bros., Inc.
B. Green Co., Frosted Foods Div.
McRoberts Bros., Inc.
New England Frosted Foods
Snowkist Frozen Foods
Washington Frosted Foods

The project is under the general supervision of Joseph F. Herrick, Jr., Handling and Facilities Research Section, Transportation and Facilities Branch, Marketing Research Division. Frederick C. Winter, associate professor of industrial engineering, Columbia University, and consulting industrial engineer to the Branch, provided guidance and helpful suggestions. Special credit is due Catharine A. Perry of the Branch for preparing the sketches included in this report.

Other reports on frozen food marketing issued by the U. S. Department of Agriculture include:

"Marketing Frozen Foods--Facilities and Methods." June 1949

"Planning a Wholesale Frozen Food Distribution Plant." Marketing Research Report No. 18, June 1952

"Some Improved Methods of Handling Frozen Food in Wholesale Plants." Marketing Research Report No. 107, November 1955

"Materials Handling in Public Refrigerated Warehouses." Marketing Research Report No. 145, July 1957

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June 1959

SUMMARY

Productivity can be increased 161 percent and costs reduced 54 percent when recorders and transcribers, in conjunction with automatic accounting equipment, are used by frozen food distributors in lieu of the manual method to receive salesmen's orders.

If the distributors receive all orders from salesmen, costs can be reduced $4.54 for each 100 orders received. However, if 80 percent of the orders are received from salesmen and 20 percent are received directly from customers, the savings would amount to only $3.64 per 100 orders. Orders received directly from customers must be handled by order takers using the manual method.

Two firms that changed over from the manual method to the mechanized method of order processing made substantial savings. One firm handling 900 orders daily saved $18,745 annually. A second firm handling 300 orders daily achieved annual savings of $3,167.

Firms without automatic accounting equipment did not benefit from using recording and transcribing equipment because it was impossible to eliminate writing out orders in longhand. Moreover, as additional equipment was necessary, the costs of mechanizing order processing were greater than those of the manual method.

MECHANICALLY PROCESSING WHOLESALE FROZEN FOOD ORDERS

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Transportation and Facilities Branch
Marketing Research Division 1/

INTRODUCTION

Frozen food wholesalers, like most other service wholesalers, customarily use clerks to record telephone orders. As each telephone order received concurrently requires a separate clerk, the warehouse switchboard is often jammed. Busy signals mean that the customer or salesman cannot place orders. To make the operation of the plant as smooth and efficient as possible, a number of wholesalers have switched over to recording and transcribing equipment for receiving orders from salesmen.

The objectives of the research on processing orders for wholesale frozen food were to evaluate methods that might: (1) Save the customer's time, (2) save the salesman's time, (3) cut office overhead, (4) reduce telephone costs, (5) reduce overloading of the switchboard, (6) fill orders faster, and (7) speed invoicing.

Studies covered both wholesale distributors who used automatic accounting equipment and those who used conventional accounting methods.

This study is part of a larger research project covering the development of improved methods and equipment to make wholesale frozen food distribution operations more efficient.

MANUAL ORDER RECORDING

Order processing begins when a salesman or customer places a telephone call to the office of the wholesale distributor (fig. 1). The switchboard operator answers the call and rings the extension of an order taker. The order taker records the date and customer's name on a preprinted order sheet. Quantities of various items of frozen food to be purchased are recorded on the order sheet as the salesman or the customer dictates the information. After the call has been completed and the address, credit rating, and route have been added, each order sheet is turned over to an employee who selects the tabulating cards. The selector examines each order sheet and pulls cards to identify name and address, credit rating, and products. After all cards have been pulled they are assembled with the order sheet for checking by another employee.

1/ Mr. Allegri is no longer associated with the U. S. Department of Agriculture.

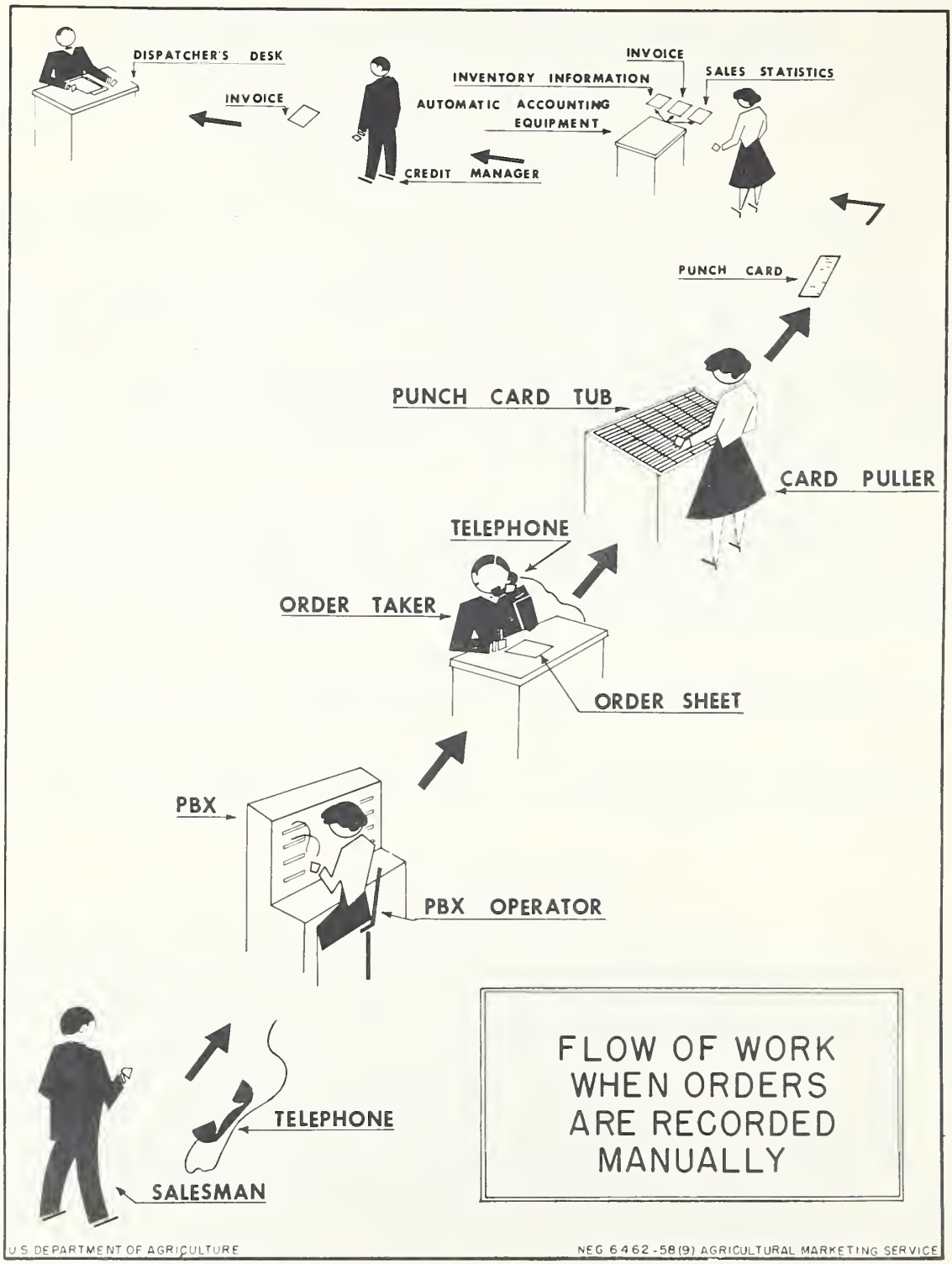
DISPATCHER'S DESK
INVOICE
INVOICE
INVENTORY INFORMATION
SALES STATISTICS
AUTOMATIC ACCOUNTING EQUIPMENT
CREDIT MANAGER
PUNCH CARD
PUNCH CARD TUB
CARD PULLER
TELEPHONE
ORDER TAKER
ORDER SHEET
PBX
PBX OPERATOR
TELEPHONE
SALESMAN
FLOW OF WORK WHEN ORDERS ARE RECORDED MANUALLY
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Figure 1

All cards pulled for an order are next run through automatic accounting machines that print an invoice and punch a summary card for inventory and sales control.

Printed invoices are then routed to the credit manager who verifies the credit information. Checked invoices next move to the dispatching room where they are sorted out according to delivery routes. Order assemblers receive a set of these routed invoices and use them to select from storage the items needed to fill the orders. Route trucks are then loaded, and drivers receive a copy of each invoice for making deliveries.

Cost data included in this report are limited to three operations: Receiving calls, taking orders, and pulling cards. Costs of checking cards, printing and checking invoices, routing, assembling, and truck loading will remain the same whether the order is handled manually or with recording and transcribing equipment. Different order-processing methods are compared on the basis of 100 frozen food orders. An average of 14 punchcards are pulled per order: 11 for frozen foods and 3 for customer's name, address, and credit information. About 1,400 punchcards therefore, are pulled for 100 orders.

As shown in the tabulation below, receiving, transcribing, and pulling cards for 100 orders called in by salesmen requires 5.51 man-hours of labor in the plant:

Operations	Productive time per 100 orders Man-hours
Telephone operator:	
Receives signal, plugs phone jack and signals order taker.	0.19
Order taker:	
Picks up phone	.07
Grasps and positions pad	.15
Picks up pencil	.17
Writes customer's name and date	.27
Writes order	.95
Puts phone in cradle and completes order	.35
Refers to customer listing	.24
Writes customer's address (when required)	.27
Puts pencil down	.08
Tears order sheet from pad	.28
Places order sheet in "out" basket	.12
Total	2.95
Tabulating card selector:	
Walks 10' to order taker's desk and returns to tub room	.06
Examines order sheet, pulls credit card, examines order sheet, pulls name and address cards	.42
Walks from center of tub to order sheet section	.15
Places sheet on center tub	.08
Pulls product cards	.73
Moves or turns order sheet	.08
Pulls product cards	.70
Places order sheet in stack on side center	.08
Places cards in stack on side counter	.07
Total	2.37
Total	5.51

At an assumed wage rate of $1.50 per hour, the cost of processing 100 orders by this method is $8.27. This cost includes $0.29 for the switchboard operator's productive time in putting the calls through to order clerks. 2/ Most of the time spent (2.95 man-hours) in processing 100 orders is required by order clerks to receive salesmen's orders over the telephone and to write this information on order sheets. At a wage rate of $1.50 per hour the average cost of writing this information on 100 order sheets is $4.43.

Order sheets are used by the tabulating-card selector to pull punchcards from which invoices are printed by automatic accounting machines. These workers require 2.37 man-hours to pull punchcards for 100 orders which, at a wage rate of $1.50 per hour, amounts to $3.55.

Since no equipment is involved, the costs of this method include $8.27 for labor, plus materials cost of approximately $0.10 per 100 preprinted order sheets. This brings the total cost of processing orders by the manual method to $8.37 per 100 orders.

MECHANIZED ORDER RECORDING

Recording and transcribing equipment was used in three plants studied. The same method was used in each of these plants.

Method of Operating Equipment

The switchboard operator plugs each salesman's call into a recording machine (fig. 2), which records it on a plastic record. The switchboard operator also enters the time of the call, salesman's name or number, the number of orders called in, and the recording number in a logbook for reference and control purposes. Salesmen were instructed to call in after they had received five to seven orders to prevent jamming the switchboard and to eliminate the concentration of calls in a short period of time.

Not all of the "order" calls received by the switchboard operator were placed on recording machines. Customers who call in their orders talk directly with order clerks. However, recording machines replaced the order takers who formerly were required to handle salesmen's calls. Order takers continued to receive direct calls from customers because it is impossible by mechanical means to provide them price information and to promote the sales of new items, specials, and other products.

It was found that when five or more salesmen regularly called in their orders by telephone, recording machines expedited service and almost entirely eliminated busy signals on the switchboard. It was also found that when

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2/ As this study is concerned with the comparative efficiency of two methods used in order processing, only the productive time of the switchboard operator associated with these methods is used. Delay or waiting time has been omitted because it was not possible to obtain a reliable measure of unproductive time between calls from salesmen with orders. The operator's time is that measured to receive calls from salesmen and signal the order clerks (or plug the calls into a recorder extension for mechanized order recording).

Figure 2.--The switchboard operator starts the recording machine.

mechanized order-recording installations were tailored to meet peak volume periods, order clerks and salesmen spent less time on the telephone and more time in selling and contacting new customers.

After salesmen's orders were recorded and entered in the switchboard operator's logbook, records were passed through an opening to the card pulling room (fig. 3). There, a card puller inserted the recording in a transcribing machine and played it back for instructions. Transcribers were so wired to a control switch that the card puller could play part of the recording, stop the transcriber, pull the required cards, then start the transcriber again to pull another group of cards or to complete the order. When necessary, a portion of the recording could be repeated for clarification of the items previously transcribed (fig. 4).

The punchcard tubs in the accounting room were arranged so that the card pullers did a minimum amount of walking. Tubs most frequently used were most easily accessible. For ease of control and greatest efficiency in the card-pulling operation, the card arrangement within the tubs should correspond to the order in which items are listed on the salesman's order sheet.

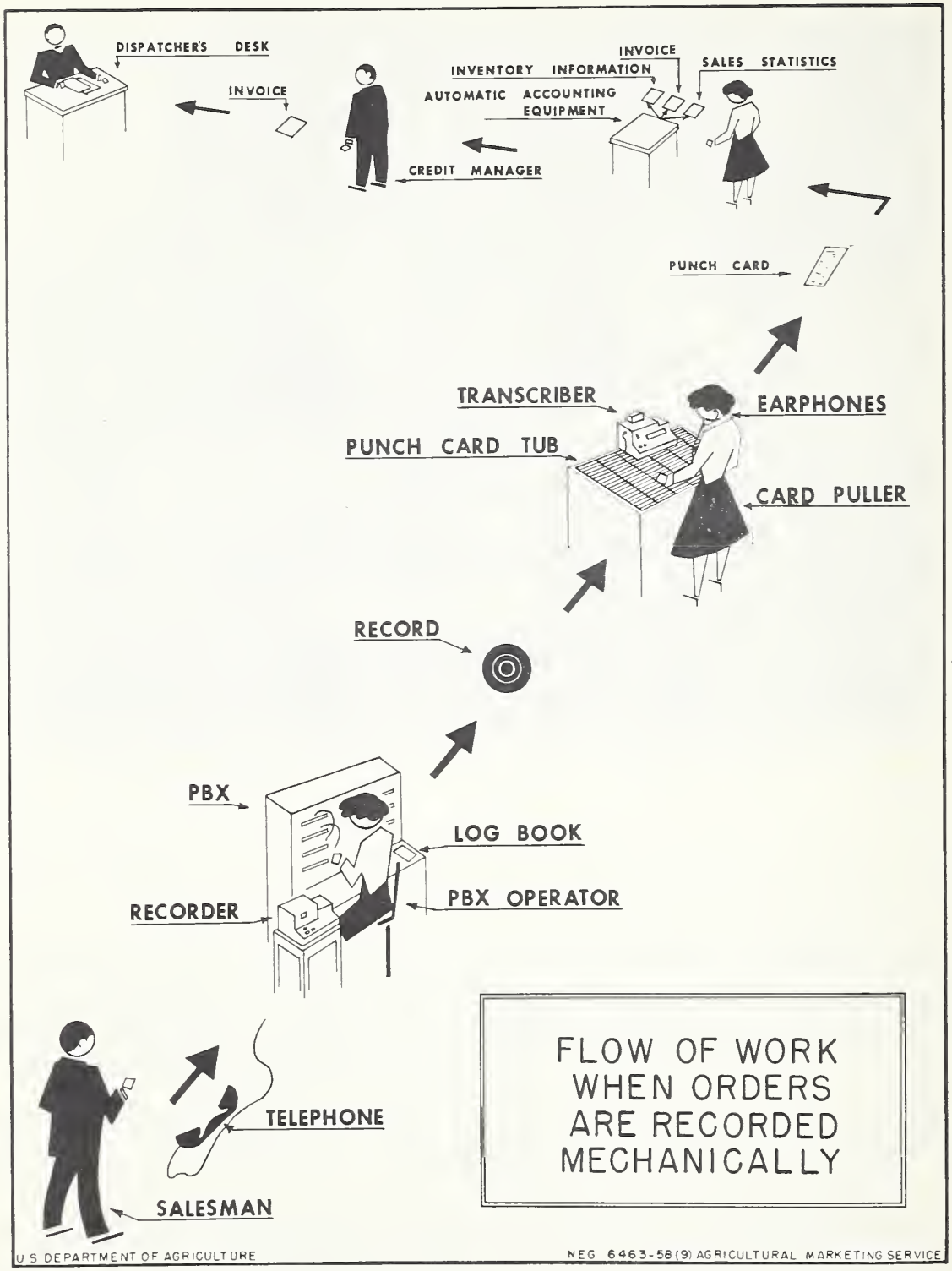
DISPATCHER'S DESK
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Figure 3.

Figure 4.--The card puller selects cards as the order is transcribed.

When a card puller completed an order or a group of orders the recording and the selected cards were checked by another employee. It was found that the operation of pulling the product cards was relatively free from "selecting" errors when recordings were used.

Following the checking operations, recordings were filed and the checked product cards were processed through the automatic accounting machines and verified by other office personnel by the same method described under the manual system.

Advantages and Savings

Mechanization of order recording resulted in: (1) A reduction in the number of order clerks required, (2) minimization of overtime for pulling product cards from handwritten order lists, (3) fewer errors in recording orders, (4) reduced phone costs, (5) elimination of almost all switchboard overloading, (6) increased time for salesmen to make new customer contacts and to sell, (7) faster service for customers calling in orders, (8) preparation of invoices at a constant pace during the day, (9) a reduction in office space required for the order taking department, and (10) more efficient use of the dispatcher's time in making up truck routes because all the invoices were received during regular office hours.

In addition to these advantages, it was possible to use the recording equipment for office dictation after the order department was closed for the day.

Labor requirements totaled 2.11 man-hours for recording 100 orders from salesmen and for selecting and pulling cards as shown in the following tabulation:

Operation	Productive time per 100 orders Man-hours
Telephone operator:	
Plugs phone jack, depresses relay switch, signals caller.	0.19
Completes call and disconnects caller. When record has been used up, removes, replaces, and passes record through opening to card selector	.25
Total.	.44
Tabulating card selector:	
Walks to switchboard 10' and returns 10' to tabulating room	.06
Puts record in machine and depresses start lever	.04
Adjusts headset and presses repeat switch.	.05
Listens for customer information	.27
Pulls header cards.	.20
Pulls product cards and stops machine.	.98
Places cards and record in stack on counter top.	.07
Total.	1.67
Total	2.11

Using a wage rate of $1.50 per hour, the total labor cost per 100 orders is $3.17. Of this total, the telephone operator accounts for 0.44 man-hour or $0.66 per 100 orders. 3/ Selecting and pulling punchcards required 1.67 man-hours at a cost of $2.51 per 100 orders.

The allocated cost for equipment (recorder, transcriber, voice-operated relay, connector recorder, and auxiliary equipment) increases the cost per 100 orders $0.28. The cost of records adds another $0.38 for a total additional cost of $0.66. Total combined costs for labor and equipment are $3.83.

COMPARISON OF MANUAL AND MECHANIZED ORDER RECORDING

The mechanical method of processing orders offers significant savings (table 1). The manual method required 5.51 man-hours per 100 orders in contrast to 2.11 man-hours when the recording and transcribing method was

3/ See footnote 2.

Table 1.--Labor, material, and equipment costs for receiving and transcribing 100 orders in frozen food wholesale plants when automatic accounting machinery is used 1/

Method and operation	Labor		Material		Equipment			Total cost
	Time	Cost (at $1.50 per hour)	Records	Order sheets	Time	Cost per hour 2/	Cost	
	Man-hours	Dollars	Dollars	Dollars	Hours	Dollars	Dollars	Dollars
Manual order method:								
Telephone operator 3/	0.19	0.29	-	-	-	-	-	0.29
Order clerk converts telephoned orders to hand-written sheets	2.95	4.43	-	0.10	-	-	-	4.53
Tabulating card selector	2.37	3.55	-	-	-	-	-	3.55
Total	5.51	8.27	-	0.10	-	-	-	8.37
Mechanized order method:								
Telephone operator 3/	.44	.66	0.19	-	0.44	0.37	0.16	1.01
Tabulating-card selector	1.67	2.51	.19	-	1.67	.07	.12	2.82
Total	2.11	3.17	.38	-	2.11		.28	3.83

1/ Since it was difficult to segregate telephone costs in most instances these costs have not been included. However, substantial reductions in telephone costs did occur after mechanization.

2/ Includes recorder, transcriber, voice operated relay, and connector recorder; excludes automatic accounting machinery. See table 3 for a detailed analysis of the costs of ownership and operation of equipment.

3/ For the low cost of telephone operator's labor, see footnote 2, page 8.

used, which represents a productivity increase of 161 percent. The cost of both equipment and labor by the mechanical method is $3.83 per 100 orders or $4.54 less than the total cost of $8.37 by the manual method. Thus a firm that decides to retain the old method could spend more than twice as much as a competitor for this part of the job.

A substantial part of this cost reduction can be attributed to the elimination of longhand recording of orders. Card selectors also required less time to pull cards for 100 orders when recordings were used than when order sheets filled out in longhand were used. Listening to a record and selecting cards required 1.67 man-hours per 100 orders; reading from an order sheet and selecting cards required 2.95 man-hours for the same number of orders.

Most frozen food wholesalers receive orders directly from some of their customers. These orders must be handled by order takers using the old method. If 20 percent of all orders received are directly from customers and are recorded manually, the combined labor and equipment costs using both methods would be $4.73 per 100 orders. 4/ The saving of $3.64 per 100 orders received still represents a substantial saving over the old method.

Case Studies

Two of the firms studied converted from the manual method of order processing to the mechanized method with impressive savings. One firm handling 900 orders daily saved $18,745 annually. A second firm handling 300 orders daily achieved annual savings of $3,167. Details of the costs for both the old and new methods for each firm follow:

4/ This figure is equal to 80 percent of $3.83 per 100 orders for the new method plus 20 percent of $8.37 per 100 orders for the old method, or $3.06 plus $1.67 equals $4.73 per 100 orders.

Annual costs in one plant for processing 900 frozen food orders daily by 2 methods are compared below:

Old Method		New Method	
Method: Salesmen's and customers' calls received by order takers. Long-hand order lists are written and sent to the card pulling room. 1/		Method: Customer calls received by order takers (old method used). Salesmen's calls recorded on records and transcribed in the card pulling room. 1/	
Workers required:		Workers required:	
6 order takers		2 order takers	
2 punchcard selectors		2 punchcard selectors	
1 switchboard operator		1 switchboard operator	
9		5	
Equipment required:		Equipment required:	
None		6 recorders	
		3 transcribers	
		6 signal lights	
Annual cost:		Annual cost:	
Labor		Labor	
Base pay	$28,080	Base pay	$15,600
Overtime	6,750	Overtime	-
Order sheets	234	Records	889
Equipment cost	-	Equipment cost	1,630
Telephone	4,200	Telephone	2,400
Total	$39,264	Total	$20,519

Annual Savings $18,745

1/ Thirty-two salesmen are employed by this company.

Annual costs in another plant that processed 300 frozen food orders daily by 2 methods are compared below:

Old Method		New Method	
Method: Salesmen's and customers' calls received by order takers. Long-hand order lists are written and sent to the card pulling room. 1/		Method: Customer calls are received by an order taker (old method used). Salesmen's calls recorded on records and transcribed in the card pulling room. 1/	
Workers required:		Workers required:	
2 order takers		1 order taker	
1 punchcard selector		1 punchcard selector	
1 switchboard operator		1 switchboard operator	
4		3	
Equipment required:		Equipment required:	
None		1 recorder	
		1 transcriber	
		1 signal light	
Annual cost 2/		Annual cost 2/	
Labor		Labor	
Base pay	$12,480	Base pay	$9,360
Overtime	585	Overtime	-
Order sheets	78	Records	296
Equipment	-	Equipment	320
Total	$13,143	Total	$9,976

Annual Savings $3,167

1/ Seven salesmen are employed by this company.

2/ Telephone costs were not included because there was no significant change in them.

MECHANIZED ORDER RECORDING WHEN CONVENTIONAL ACCOUNTING METHODS ARE USED

Because of its relatively high initial cost, the use of automatic accounting equipment cannot be economically justified for distributors handling comparatively small volumes of frozen foods. 5/ In the course of this study consideration was given to the possibility of mechanizing order recording when conventional accounting methods and equipment were used.

5/ Members of the National Frozen Food Distributors Association estimate that business volume must be at least one million dollars a year (gross sales) to justify the use of automatic accounting equipment.

Using conventional methods, longhand order sheets must be prepared for the use of warehouse personnel in routing and filling orders. The sheets also are used in the accounting office for price extensions, invoice preparation, and billing.

However, the labor and equipment costs shown in table 2 indicate that the old method was less costly. The new method cost $5.38 per 100 orders processed. The cost for the same number of orders using the old method was $4.82.

APPENDIX

Cost of Ownership and Operation of Recording and Transcribing Equipment

The costs incurred when recording and transcribing equipment is used in frozen food order processing can be grouped into two major categories: (1) Ownership costs, which are considered fixed or relatively stable from year to year over a wide range of equipment use, and (2) operational costs, which are variable, and fluctuate in direct relationship with the hours of use of the equipment.

Costs of equipment ownership include depreciation, taxes, interest, and insurance. The owner is entitled to recover the purchase price of the equipment and accessories by the time it reaches the end of its economic life. This useful life is estimated by the Internal Revenue Service to be 6 years for dictation equipment. The straight line depreciation method was used in this study to obtain the annual rate of depreciation. This was accomplished by dividing the total cost of equipment by the number of years of its estimated life. State and municipal taxes, interest on the capital invested, and insurance premiums covering fire, disaster, and other forms of protection applicable to the equipment, are other items that round out the ownership costs, and are incurred on an annual basis regardless of use.

Total hourly cost of ownership and operation of recording and transcribing equipment are shown in table 3. These hourly cost rates are based on assumed hours of annual use and other factors.

Recording and Transcribing Equipment

The recording and transcribing system consists of three major components; a voice operated relay, the recorder, and a transcriber. The recorders are wired into an extension jack in the switchboard of the distributor. When a salesman calls in, the telephone operator plugs his call into a recorder extension. The turntable starts as soon as complete contact is made in the jack. When the salesman starts to dictate his order, the voice operated relay turns on a light; when he is finished, the light turns off. At that point the operator keys in to check with the salesman for additional instructions or to pass on messages to him. When the telephone call has been completed, the operator makes a record of the call in a logbook. When the

Table 2.--Labor, material, and equipment costs for receiving and transcribing 100 orders in frozen food wholesale plants when conventional accounting methods are used 1/

Method and operation	Labor		Material		Equipment			Total cost
	Time	Cost (at $1.50 per hour)	Records	Order sheets	Time	Cost per hour 2/	Cost	
	Man-hours	Dollars	Dollars	Dollars	Hours	Dollars	Dollars	Dollars
Manual order method:								
Telephone operator 3/	0.19	0.29	-	-	-	-	-	0.29
Order clerk converts telephoned order to handwritten sheets	2.95	4.43	-	0.10	-	-	-	4.53
Total	3.14	4.72	-	.10	-	-	-	4.82
Mechanized order method:								
Telephone operator 3/	.44	.66	0.19	-	0.44	0.37	0.16	1.01
Order clerk transcribes order from recording	2.60	3.90	.19	.10	2.60	.07	.18	4.37
Total	3.04	4.56	.38	.10	3.04		.34	5.38

1/ Since it was difficult to segregate telephone costs in most instances these costs have not been included. However, substantial reductions in telephone costs did occur after mechanization.

2/ Includes recorder, transcriber, voice operated relay, and connector recorder. See table 3 for a detailed analysis of the costs of ownership and operation of equipment.

3/ For the low cost of telephone operator's labor, see footnote 2, page 8.

Table 3.--Ownership and operating costs for recording and transcribing equipment

	Recorder and voice-operated relay	Transcriber and auxiliary equipment
Investment:		
Initial cost	$655.00	$435.00
Installation	32.75	21.75
Total investment	$687.75	$456.75
Ownership cost per year: 1/		
Depreciation	$114.63	$ 76.13
Interest	20.06	13.32
Insurance and taxes	27.51	18.27
Operating cost per year: 2/		
Power	1.35	5.40
Maintenance	22.00	22.00
Total annual cost	$185.55	$135.12
Assumed use per year	500 hours	2,000 hours
Cost per hour	$0.3711	$0.0676

1/ Straight line depreciation based on a 6-year estimated life. Interest was estimated at an annual rate of 5 percent and insurance and taxes at 4 percent of the total investment.

2/ Power consumption is approximately 100 watts per hour. Cost of power was estimated at $0.027 per kilowatt hour. Maintenance costs represent charges made by manufacturers for service contracts.

record has been filled with salesmen's orders it is removed from the recorder and turned over to the card selectors or order takers. The record is then inserted in the transcriber and played back so that an order can be written up or two cards pulled for the order.

During the course of the studies made, two types of recording and transcribing equipment were tested, but there were no significant differences in labor requirements and equipment costs.

Research Techniques

Time-study techniques were used to determine labor requirements for both the old and new methods. During the course of the time study, the observer made an estimate of the effort expended by the worker in accomplishing his task. If the effort level was judged to be normal, a figure of 100 percent was used. If the level was above normal, that is, if the employee

worked at a more rapid pace than normal, the percent would have been higher than 100. If the pace was slower than normal, the percent would have been lower. The observed time for performing a given task was adjusted for worker effort by multiplying by the rate in percent. This product became the base time. This time was increased in order to make provision for rest to overcome fatigue and for personal needs. The base time was increased by 10 percent to give the productive time on which the labor requirements in this report are based. The 10 percent included an allowance of 5 percent for fatigue and 5 percent for personal needs.